

REMARKS/ARGUMENTS

In view of the following remarks and arguments, Applicants believe the pending application is in condition for allowance.

I. Status of the Claims

Claims 11-42 are pending and are presented herein as a courtesy to the Examiner. No amendment to the claims has been made.

II. Amendments to the Specification

The specification has been amended to correct typographical errors.

Support for the first amendment ("~~europium bromide~~ lead iodide") is found in the specification on p. 28, lines 6-7 ("lead iodide") and on p. 29, lines 7, 9, 11-12, and 13 ("lead iodide").

Support for the second amendment ("~~europium~~ cesium iodide") is found in the specification on p. 34, lines 23 and 25 ("cesium iodide"), on p. 35, lines 9 and 13 and Table 1 ("cesium iodide"), and on p. 36, lines 18 and 22 ("cesium iodide").

Support for the third amendment ("increasing the proportion of ~~europium bromide~~ cesium iodide vapor deposited from 0 to 40% by weight") is found in the specification on p. 35, Table 1, which shows the proportion of cesium iodide to be between 0 and 40 % by weight but that of europium bromide to be between 12.5 and 29 % by weight.

No new matter is added by the amendments.

III. Acknowledgment of Allowable Subject Matter

Applicants thank the Examiner for the acknowledgment of allowable subject matter in claims 35-38.

IV. Claim Objections

Claims 35-38 are objected to as being dependent upon rejected base claims but would be allowable if rewritten in independent form including all the elements of the base claims and any intervening claims.

Applicants respectfully submit that, as argued below, the references cited by the Examiner do not support rejection of any of the base or intervening claims and respectfully request that the objections thereof be withdrawn.

Va. Claim Rejections — 35 U.S.C. § 102(b)

Claims 11-30 and 39-42 are rejected under 35 U.S.C. § 102(b) as anticipated by U.S. Patent No. 5,783,292 to Tokito et al. ("Tokito"). The Examiner contends that Tokito discloses every element recited in the claims. Applicants respectfully traverse the rejections.

Tokito discloses an emissive layer containing “an organic compound dispersed uniformly in an inorganic compound, or a superlattice structure made of an organic compound and an inorganic compound.” Tokito, Abstract, lines 8-11. But Tokito does not disclose an inorganic compound dispersed in an organic compound as recited in claim 11. Regarding the dispersion structures, Tokito further discloses that “the distance between particles of the organic compound dispersed in the inorganic compound is not larger than 50 Å.” Tokito, column 4, lines 12-14. Regarding the superlattice structures, Tokito further discloses that “organic compound films and inorganic compound films are alternately disposed.” Tokito, column 5, lines 57-59.

In addition, Tokito does not teach or suggest that a change in luminescent color is effected by forming the dispersion. In fact, Tokito discloses the opposite:

{W:\20441\0202715us0\00863074.DOC 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021 1022 1023 1024 1025 1026 1027 1028 1029 1030 1031 1032 1033 1034 103

indicates that the composite thin film of magnesium fluoride [an inorganic compound] and perylene [an organic compound] functions as an emission layer 14 like the perylene film in the conventional devices.

Tokito, column 12, lines 42-49 (emphasis added). Thus, Tokito also does not disclose the “change luminescent color” element of claim 11 since Tokito’s film did not change the color of the emitted light upon dispersion formation: it emitted the same color as the prior art devices.

At least for the reasons stated above, Tokito does not anticipate claim 11. Applicants respectfully request that the rejection thereof be withdrawn.

Claims 12-30 and 39-42 depend directly or indirectly from claim 11. Thus, at least for the same reasons as stated above, Tokito does not anticipate claims 12-30 and 39-42. Applicants respectfully request that the rejections thereof be withdrawn.

Vb. Claim Rejections — 35 U.S.C. §§ 102(b) & 103(a)

Claims 11-22 and 27-34 are rejected under 35 U.S.C. § 102(b) as anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as obvious over U.S. Patent No. 5,871,579 to Liang et al. (“Liang”). The Examiner contends that Liang discloses every element recited in the claims or, in the alternative, that Liang in view of the Examiner’s statements of the ordinary skill in the art renders the claims obvious. Applicants respectfully traverse the rejections on either ground.

Claim 11 recites “an inorganic compound dispersed in at least one of the organic compound layers.” Liang only discloses perovskites containing organic and inorganic moieties. Liang does

not disclose a mixed dispersion of an inorganic compound in an organic compound. Liang makes it clear that the term “perovskite” refers to a crystalline structure of a single compound, not a mixed dispersion of two or more compounds. *See, e.g.*, Liang, column 7, lines 51-52 (“the formed perovskite film is well-crystallized”); column 9, lines 9-12 (“[t]he structure of the layered perovskites is highly anisotropic and crystal growth tends to occur most easily along the plane of the perovskite sheets and more slowly along the perpendicular direction to the sheets”); column 11, lines 27-31 (“[t]he fact that thin films of the layered perovskites made by the dipping technique have strong photoluminescence indicates that they are well-crystallized and have few non-radiative decay centers for the excitons”).

Thus, a PbI_2 crystal, for example, would not disclose a mixed dispersion of solid Pb in solid I_2 or solid I_2 in solid Pb. Likewise, Liang’s organic-inorganic perovskites do not disclose “an inorganic compound dispersed in at least one of the organic compound layers” recited in claim 11.

At least for this reason, Liang does not anticipate claim 11. Applicants respectfully request that the rejection of the claim on anticipation ground be withdrawn.

Claims 12-22 and 27-34 depend directly or indirectly from claim 11. Thus, at least for the same reason as stated above, Liang does not anticipate claims 12-22 and 27-34. Applicants respectfully request that the rejections of the claims on anticipation ground be withdrawn.

Claim 11 is rejected in the alternative on obviousness ground in case Liang “is not sufficient to anticipate a direct current electroluminescent device with the disclosed perovskite layer.” Office Action dated May 25, 2006, page 3, lines 9-10. As discussed above, however, neither Liang nor the

At least for this reason, Liang in view of the Examiner's statements of ordinary skill in the art does not render claim 11 obvious. Applicants respectfully request that the rejection of the claim on obviousness ground be withdrawn.

Vc. Claim Rejections — 35 U.S.C. § 102(e)

Applicants respectfully traverse the rejections of claims 11-18 by submitting a Declaration under 37 C.F.R. § 1.131 along with documentary evidence in the form of Exhibits A through D. The Declaration, signed by both inventors, states that the inventors completed and reduced to practice the invention as embodied in claims 11-18 prior to the earliest filing date of Seo.

Exhibits C and D of the Declaration are in-house documents written in Japanese, the English translations of which are provided as Exhibits A and B, respectively. The first and second experiments disclosed in Exhibit C correspond to EXAMPLES 9 and 7, respectively, disclosed in the specification of the present application. The first figure presented in Exhibit C (“EL Intensity vs. Wavelength”) corresponds partially to Figs. 18 and 20 of the specification. The first and second experiments disclosed in Exhibit D correspond to EXAMPLES 2 and 1, respectively, disclosed in the specification. And the first three figures presented in Exhibit D correspond, at least partially, to Figs. 2, 3, and 5, respectively, of the specification.

As such, Exhibits C and D disclose the elements recited in claim 11: a plurality of organic compound layers disposed between an anode and a cathode; and an inorganic compound dispersed in one of the organic compound layers, thereby changing the luminescent color. Therefore, Applicants respectfully submit that they completed the invention as embodied in claim 11 prior to the effective date of Seo, thus antedating this reference such that it is not prior art as to claim 11. Accordingly, claim 11 is allowable.

Claim 12 depends from claim 11. Exhibits C and D further disclose the additional element recited in claim 12: that luminescence of the inorganic compound is achieved by a direct current voltage. Therefore, Applicants respectfully submit that they completed the invention as embodied in claim 12 prior to the effective date of Seo, thus antedating this reference such that it is not prior art as to claim 12. Accordingly, claim 12 is allowable.

Furthermore, Applicants disagree that Seo discloses every element recited in claims 11-22. Claim 11 recites “an inorganic compound dispersed in at least one of the organic compound layers.” The Examiner states that Seo discloses this element because Seo “teaches an electroluminescent device comprising a mixed layer of organic compound CBP [4,4’-bis(carbazol-9-yl)biphenyl] and platinum complex ‘PtOEP’.” Office Action dated May 25, 2006, page 3, lines 14-15. Seo further

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explains that PtOEP stands for “2,3,7,8,12,13,17,18-octaethyl-21H, 23H-porphyrin-platinum.” Seo, para. [0108]. The Examiner implicitly contends that PtOEP is an inorganic compound.

Contrary to the Examiner’s contention, Applicants have described organometallic compounds such as PtOEP to be among organic compounds, not inorganic compounds, in the specification. *See, e.g.*, Specification, page 4, lines 6-7 (“organic dyes and fluorescence dyes such as organometallic complexes”); page 10, lines 11-14 (“[e]xamples of the organic material layer having electron transport properties include . . . alumiquinolinol complexes”); page 12, lines 8-11 (“examples of the organic compound include . . . aluminum-quinolinol complexes and derivatives thereof”). An alumiquinolinol, or equivalently, aluminum-quinolinol complex $[Al(C_9H_6NO)_3]$, like PtOEP, is an organometallic compound.¹ Under Applicants’ usage of the term “organic,” they are both organic compounds.

Thus, Seo does not disclose an inorganic compound dispersed in an organic compound as recited in claim 11. At least for this reason, Seo does not anticipate claim 11. Applicants respectfully request that the rejection thereof be withdrawn.

Claims 12-22 depend directly or indirectly from claim 11. Thus, at least for the same reason as stated above, Seo does not anticipate claims 12-22. Applicants respectfully request that the rejections thereof be withdrawn.

¹ For ease of reference, Tokito conveniently provides the chemical structure of an aluminum-quinolinol complex as Formula 3 in column 10.

Vd. Claim Rejections — 35 U.S.C. § 103(a)

Claims 19-26 and 39-42 are rejected under 35 U.S.C. § 103(a) as obvious over Tokito in view of the Examiner's statement of the ordinary skill in the art. Applicants respectfully traverse the rejections.

Claims 19-26 and 39-42 recite, due to their dependency from claim 11, "an inorganic compound dispersed in at least one of the organic compound layers, thereby changing the luminescent color." Rejections of these claims are asserted as an alternative to the anticipation-based rejections discussed above in case the metal fluorides disclosed by Tokito are "not sufficient to anticipate an alkaline earth metal fluoride, rare earth fluoride, transition metal fluoride or a combination of these as the inorganic material." Office Action dated May 25, 2006, page 3, lines 19-21.

The Examiner, in rejecting the claims, implicitly contends that Tokito discloses the predicate "inorganic dispersed in organic" and "change luminescent color" elements recited in claims 19-26 and 39-42. However, as discussed above in relation to the anticipation-based rejection of claim 11 in light of Tokito, Tokito neither discloses these elements nor suggests them to one of ordinary skill in the art.

At least for this reason, Tokito in view of the Examiner's statement of the ordinary skill in the art does not render claims 19-26 and 39-42 obvious. Applicants respectfully request that the rejections thereof be withdrawn.

CONCLUSION

In view of the foregoing it is believed that claims 11-42 are in immediate condition for allowance and it is respectfully requested that the application be reconsidered and that all pending claims be allowed and the case passed to issue.

If there are any other issues remaining which the Examiner believes could be resolved through a Supplemental Response or an Examiner's Amendment, the Examiner is respectfully requested to contact the undersigned at the telephone number indicated below.

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Respectfully submitted,

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